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GOODMAN FIELDER

An Investigation into ATP Misses

Located at Meadow Fresh, Christchurch

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30/01/2014

Abstract

This project was carried out in order to complete the requirements of the Master of Engineering Management degree at the University of Canterbury. The project objective was to examine the reasons for Attainment to Plan (ATP) misses at the Meadow Fresh Christchurch plant, specifically the Fresh Beverages division. ATP is a measure of how closely the production team follows the daily packing plan, and is a site Key Performance Indicator (KPI). This report describes the action plans that were developed to decrease the number of misses to the target value, an analysis of the success of these plans, and recommendations which were made around the purchase of plant equipment in order to further improve the ATP results.

Version Control

Version	Date	Changes
1.0	10/12/2013	First Draft
1.1	6/1/2014	Draft
1.2	16/1/2014	Draft
1.3	17/1/2014	Draft
2.0	27/1/2014	Final Draft

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Version	Date	Distributed to:
2.1	28/1/2014	Richard Wild
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2.3	30/1/2014	Les Richards
2.4	3/2/2014	Piet Beukman

Executive Summary

Introduction

This report is intended to outline the methodology, results and recommendations of the Attainment to Plan (ATP) project carried out in the Fresh Beverages division of the Meadow Fresh Christchurch plant. ATP measures how closely the production team achieves the set plan, and is a key site measure.

The target is to achieve ATP 90% of the time. If this target is achieved over a period it is classed as a hit; if not it is a miss. Prior to the commencement of the project, the financial year 2013 ATP result was 85.1%.

The project activities are as follows:

- Work with the production team to decrease ATP misses to around 45 per week (equating to approximately 90% ATP).
- Make recommendations around improvements to the plant that would allow ATP misses to decrease to around 25 per week.
- Produce a documented process for measuring and improving ATP, to be handed to the production team upon project completion.

Implementation

In order to achieve the first target, action plans were developed at weekly ATP review meetings. These were conceived and then implemented by the production supervisors to encourage project buy in. The following areas were addressed in the action plans:

- **Planning.** Three action plans were developed around the production planning:
    - A check sheet was developed to decrease data transfer error.
    - A tolerance was created when planning to the bag size to allow for set up.
    - The time of day that the final lite SKU was packed was altered.
- **Production.** The following concepts were tested around the daily production:
    - A water flush was implemented before the start of any Farmhouse run in order to decrease the occurrence of excessive run off.
    - Operators were instructed to leave unfinished bags of 1L bottles covered on the table at the end of the day, rather than continuing to pack until the table was empty. The objective was to decrease misses due to an excess or shortage of bottles, however, results were inconclusive.

- **Panel.** The volume of lite milk produced by panel was investigated on a daily basis, along with any excesses or shortfalls caused by the use of multiple tanks to produce the total required balance. It was found that the volume of milk produced very rarely differed from the ordered volume within a tolerance, and the use of multiple tanks had no effect on any variance.

- **Supervision.** The following changes were trialled regarding the supervisors' roles in production:

    - The supervisors ensured they provided additional support to operators during cream cut offs, particularly when cut offs occurred across multiple lines at once.

    - For three days the supervisors trialled ignoring load cell readings, and packing to the DWOR sheet with no manipulation. Trial results were inconclusive.

- **Behavioural.** The following human aspects were addressed, and found to have successful results:

    - Understanding of ATP and clarification of the target was a major factor in increasing results before any specific action plans had been implemented.

    - Results were analysed according to shift, and shift results were publicly posted. This fostered competition, particularly between supervisors, and achieved standardisation between shifts.

Results

Overall, ATP results increased significantly over the project period as seen in Figure 1. The first hit over a full week occurred in Week 47, and December was the first month to exceed the target. Unless specified above, all action plans were found to be successful. Target awareness and visible managerial interest assisted in boosting results overall. Upon project completion the ATP target was being achieved consistently day to day, with occasional misses due to specific events.

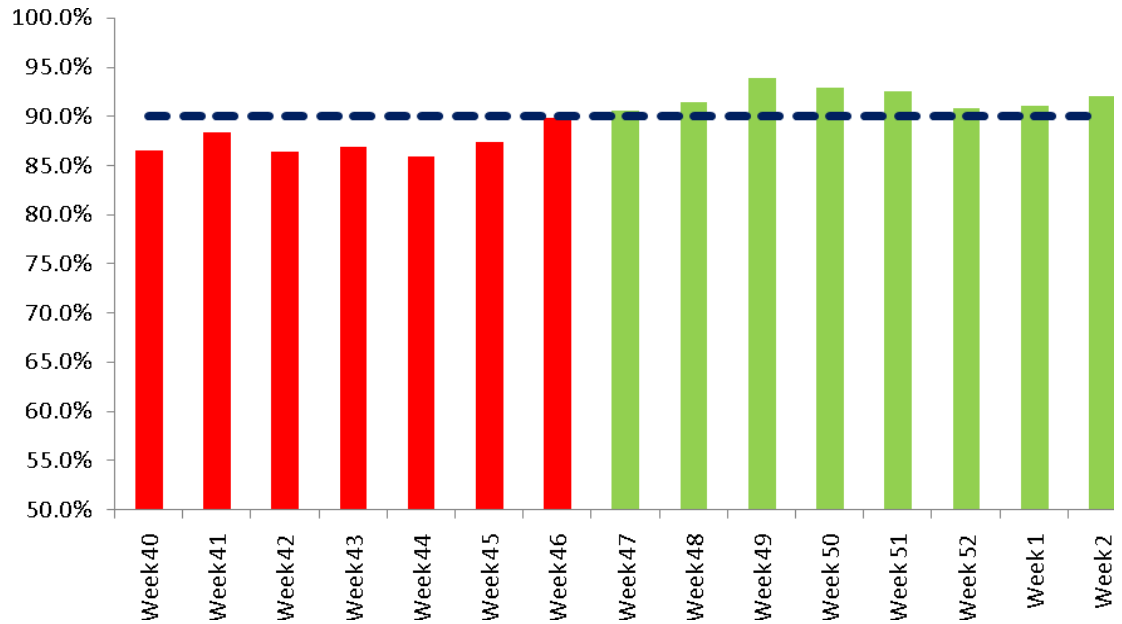

Figure 1: Weekly ATP over the project period

Recommendations

The major reasons for misses were around the over or undersupply of milk, as well as operator error. The following recommendations were made to address these issues and decrease the miss rate to around 25 per week:

- An alert system should be set up on the labellers. This would alert the operators when the process order number had been reached through a stoppage or alarm, and decrease misses due to operator error.
- Recovery tubs should be piped separately to the large recovery tank. This would decrease flow restrictions, allowing the tubs to be quickly emptied so that all run offs could start into an empty tub. Run offs would be more accurate, decreasing the frequency of milk shortages.
- A screen should be installed on/near each filler. This would make tank information readily available to operators, decreasing the chance of operators missing cut offs while walking to the redline office. This would also decrease the chance of milk making it into bottles should the wrong tank be directed to the filler.

Additionally, all action plans should be followed through after the completion of the project, and clear managerial focus should remain on achieving the targets so that progress made during the project period is not lost.

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Glossary

Terminology	Definition
ATP	Attainment to Plan. This is the measure currently used to understand how successfully the Fresh Beverages plant is running.
DWOR Sheet	An excel spreadsheet used for production planning and management. It is currently used in conjunction with SAP.
Easy Win	A simple change that can be implemented with minimal training or expense. It is predicted that small changes in procedure, planning, and staff understanding could cause the Production Team to reach their KPI.
Hit	When between 95%-110% of a process order is made, this is classed as a hit. For example, if an order of 1000 bottles is made, and between 950 and 1100 bottles are made then that run was a hit.
Miss	When less than 90% of an order is completed or more than 110% then it is classed as a miss. This project aims to decrease the number of misses per week.
KPI	Key Performance Indicator. These are the factors used to measure different areas of the business. ATP is the KPI for Fresh Beverages.
Panel	The team that processes the raw milk into the ranges of different products that Meadow Fresh packs.
Production Team	The Production Team primarily refers to the floor team including operators and supervisors, but can also include more senior staff including the production manager and team leaders.
SAP	SAP is a computer system that manages data from many sections of the Goodman Fielder business, from production, to payroll, to planning.
SKU	Stock Keeping Unit. In this setting SKU defines the different products produced by the plant, for example Meadow Fresh 1L Original Milk, or Anchor 2L Xtra Milk. Different products may count as the same milk and brand filling different sized bottles, for example Meadow Fresh 600mL Cream is different to Meadow Fresh 300mL Cream.
WIP	Work In Progress. In this report WIP refers to production materials such as milk, bottles and caps.

1.0 Introduction

This project attempted to improve on the Attainment to Plan (ATP) of the Fresh Beverages division of the Meadow Fresh plant. The Fresh Beverages ATP is a key site and business KPI. The ATP target for this area is 90%, however the financial year 2013 ATP result was 85.1%. The monthly minimum was found to be 83.7%, and the maximum was 88%. The target for F14 remains at 90%. Two outcomes of not meeting the target are increased safety stock levels, and increased production plan changes and management. These outcomes have direct financial costs in that working capital is tied up unnecessarily as indirect financial costs as a result of "waste" (rework and so forth).

The ATP level achieved is based on the number of process order 'hits' and 'misses' across all lines over a set period of time. A process order informs the production team of what and how much of a particular product is to be made. If between 95% and 110% of a process order is made it is classed as a hit. As ATP is simply a measure of performance, various administrative changes could be made to meet the target such as changing the cut offs for plan changes. Therefore this project aims to examine the reasons for misses, as this shows true process improvement.

1.1 Objective

The objective of this project was to investigate the reasons why misses have occurred, and to attempt to decrease the number of misses so that the ATP objective can be met. This involved working with the production team to produce action plans that allowed ATP misses to decrease to 45 per week. An investigation was then carried out around the restrictions of the plant equipment, and recommendations were made on what pieces of equipment should be replaced or incorporated in order to decrease misses to around 25 per week.

1.2 Deliverables

- Produce a documented procedure for measuring and improving ATP to hand over to the production team.
- Produce a report detailing improvements to the plant that would allow ATP misses to decrease to around 25 per week. The number 25 is approximate, but reflects the consistent surpassing of the 90% target.
- Produce a documented project methodology so that future site projects can be based on this one.

1.3 Project Scope

The project investigation covered the following areas:

- All fresh milk types
- All flavoured milks
- All juices

The following factors were considered to be outside of the project scope:

- Process order start times
- UHT milk
- Fresh bulk beverages (10L bags up to pallecons)

1.4 Project Methodology

The project methodology is outlined in this section. A more detailed project methodology can be seen in the attached Project Methodology report in Appendix 7.1.

1. **Definition of Current State.** Historical data was obtained and analysed in order to gain an understanding of the current ATP attainment. An overall impression of the main areas of concern was developed to guide the initial investigation.

2. **Collection of Reason Codes.** At the beginning of each day high level reason codes were obtained from the production supervisors. These provided an indication of the causes for the misses, and directed the project manager's investigation.

3. **Review Meetings.** Once a week review meetings were carried out. Here the common problems arising from the investigation were discussed. The production supervisors and planning team had the opportunity to make improvement suggestions. Action plans were then developed. Minutes were distributed for each meeting detailing the actions required from each individual or group.

4. **Action plan analysis.** The results from each action plan were analysed over the following period to test the success of the plan. The plans were then reviewed at the weekly meeting and adjusted or removed as required. This follows the 'plan-do-check-act' cycle (American School for Quality, 2004).

5. **Close up.** Upon the completion of the project, a process for calculating ATP and identifying ATP misses on a day to day basis was handed over to the production staff. A recommendation report was submitted to the site manager, and then a close up presentation was scheduled detailing the project aim, methodology and results. At the end of the presentation there was a discussion around the project methodology successes and failures.

1.5 Project Risks

A project risk analysis was carried out, and as summary of results can be seen below. The full analysis can be seen in Appendix 7.2.

- The most significant risk to the project was time delays, as it was difficult to set an accurate timeline. This was carefully managed.

- Other significant risks included the unavailability of the production team, as their presence at meetings and presentations was critical to project buy in, which was then critical to project success.

- Knowledge presented a moderate risk as the project manager was unfamiliar with the production process. Managing this required initiative from the project manager in terms of scheduling meetings, observation and asking questions.

- Overall, risk to the project was moderate. No significant issues should have arisen so long as the risks were well monitored and managed.

1.7 Literature Review

A literature review was carried out around the project components. The full review can be seen in Appendix 7.3. The following conclusions could be drawn:

- A critical factor in achieving site targets is around the treatment of workers. Relationships between workers and supervisors play a large role in the workers' desire to strive for a target.
- A significant source of waste in the process may be start ups, changeovers, equipment jams, and reprocessing out of spec product. These may be areas where recommendations are required.
- The scheduling system (at Meadow Fresh, the planner) must be able to perform a complex role. This is a process performed manually. There may be room for improvement in the system used to schedule production, and this is an area to be investigated.
- Human error is a result of the environment the company provides, and cannot be blamed on the workers. When investigating human error, the project manager must search for the root cause; then track the improvement or lack thereof once a solution is put in place to determine effectiveness. A large occurrence of human error would indicate the need for a recommendation to be focused on this area.
- Meadow Fresh uses a mixed strategy when addressing demand fluctuations, as production is run as a fixed cost centre. Therefore the full production time each day should be utilised. Achieving ATP would assist in decreasing variation between production each day, saving costs of unused production time, and then overtime.
- The measure ATP was reviewed against key classifications found in literature.
    - It is unambiguous, as it is measured on a percentage scale with a clear target
    - It is not comprehensive, as the start and finish times of the runs are not considered. However, this decision was consciously made, as any misses due to late starts would be the result of a significant event, whereas ATP is used to capture misses during business as usual.
    - It directly measures how well the production staff attain the plan.
    - It is operational, as data can be obtained easily from SAP reports.
    - It is understandable to people in the business, however it is not easily understandable to anyone unfamiliar with production measurement.

2.0 Action Plans

The following action plans were implemented to attempt to correct issues that were preventing the production team from achieving the ATP target. The method adopted was the 'Kaizen Blitz'. iSixSigma defines a Kaizen Blitz as "a sudden overpowering effort to take something apart and put it back together in a better way" (iSixSigma, 2013). In this context it has been interpreted as the implementation of all viable concepts to attempt to correct many issues simultaneously. In this way it differs to approaches which consider a control and aim to determine the effectiveness of each solution individually.

Reason codes were graphed cumulatively over time to determine the changes in miss reasons, and to determine the most significant issues. Figure 2 shows the reason code distribution for the first two weeks of investigation. Descriptions of the context for reason codes can be found in Appendix 7.4.

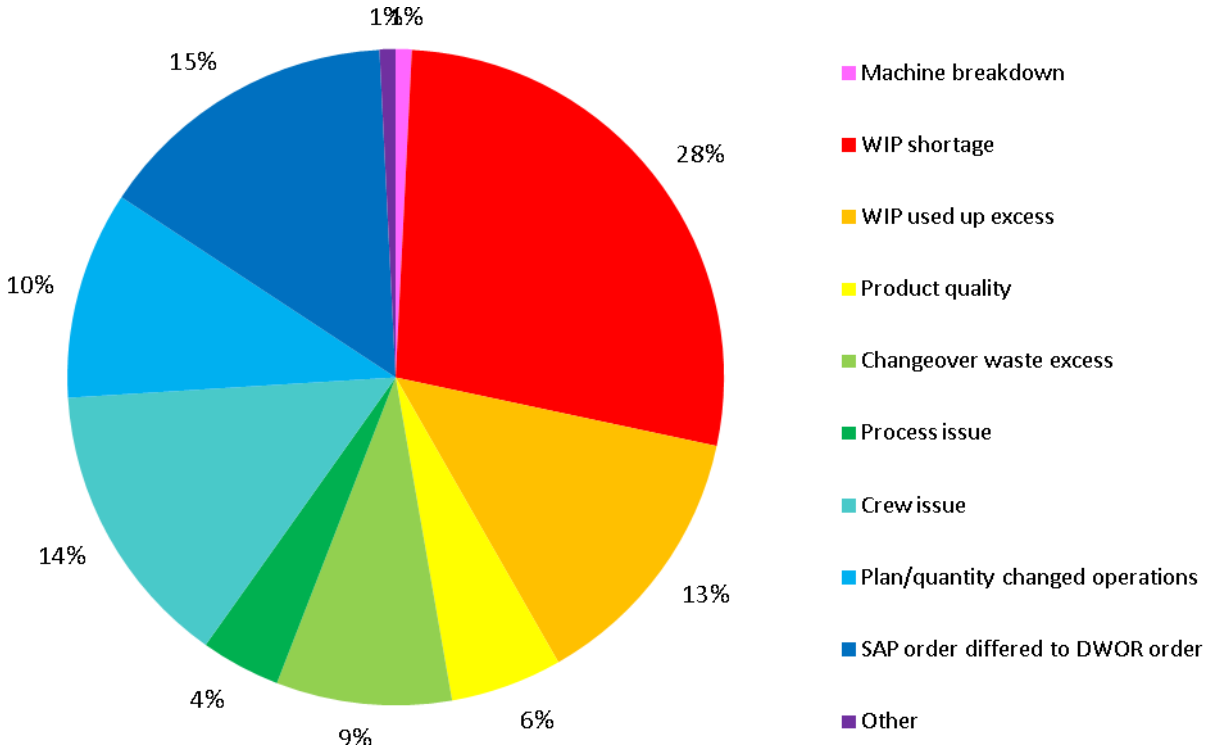

Figure 2: Reason codes for the first two weeks of investigation

2.1 Planning

2.1.1 Data Transfer between SAP and DWOR

Early in the investigation it was determined that a large proportion of misses occurred in the transfer of data between the two planning systems. Presently it is not possible to align these systems so that only one is required.

Craig Dyhrberg and Les Richards developed a check system that the planner could use to quickly ensure the numbers between the two systems were aligned. This assisted in removing the human error element from the data transfer system.

Since the implementation of the check system, the number of misses due to data transfer error dramatically decreased from making up 21% of the overall reasons for misses at the beginning of the project, to 6% by the end. Any misses are most likely to have occurred due to the check system not being utilised.

2.1.2 Planning to Bag Sizes

An issue identified was around changeover waste, specifically when setting up carton runs. Prior to the project, cartons were planned to the bag size, for example if a box contained 120 cartons then it was planned to pack 120, 240, 360 cartons etc. During the setup of each different milk type, approximately 5% of the cartons in the first box were discarded after being used for runoff.

The decision was made to trial planning to 5% less than a box size, for example 114 cartons rather than 120. This allowed for the necessary runoff without affecting the ATP. It was determined that this was valid as the runoff was a necessary step in production, therefore should not impinge on production reaching the target.

Similar issues were found for runs using small bottles (350mL, 300mL, 600mL), and also some 3L runs. The same action plan was implemented for these runs. The SKUs affected by these changes can be seen in Appendix 7.4.

Over a month long period once plans were implemented, no misses occurred on these runs. Figure 3 shows the ATP results for Cream 300mL, before and after the plan change. Before results are shown in the dark colours and after in bright. Green represents an ATP hit, while red represents and ATP miss. This figure was chosen as it is clearly representative of the general trend for all SKUs altered.

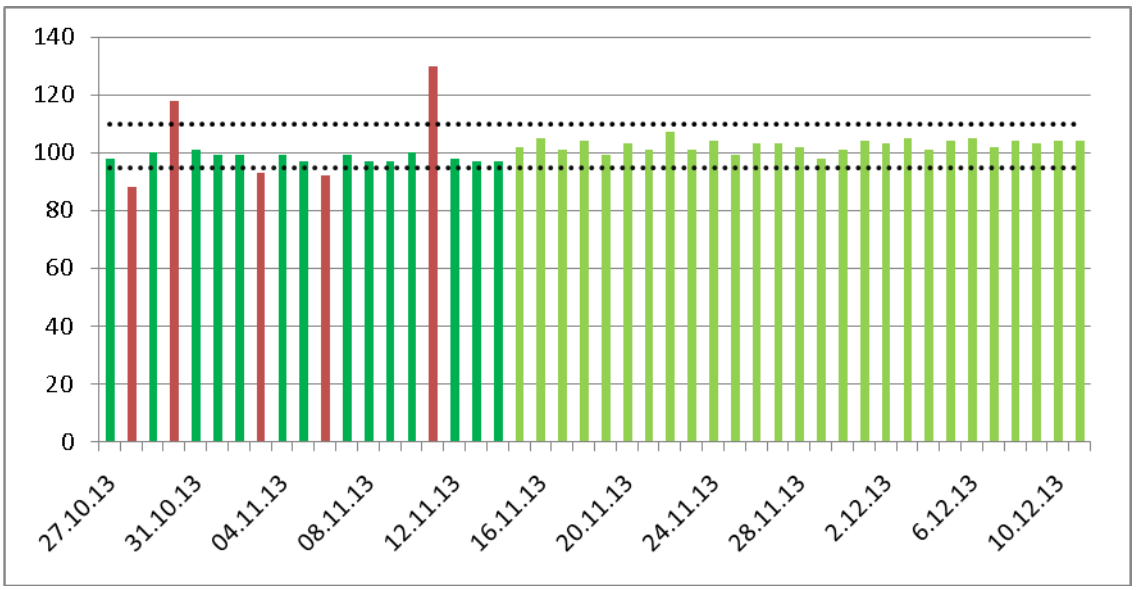

Figure 3: Cream 300mL ATP, before and after plan change

2.1.3 Lite production schedule

Some time ago all lite products were packed in the morning, however the production order was later changed so that Meadow Fresh 2L lite was packed later in the afternoon. This was so that any milk excesses or shortages would impact on the Meadow Fresh SKU rather than other SKUs which were contract packs, allowing for less flexibility.

Some supervisors believed that packing the Meadow Fresh 2L SKU early in the morning with the other lite SKUs would improve the lite ATP. This was temporarily trialled, and results can be seen in Figure 4.

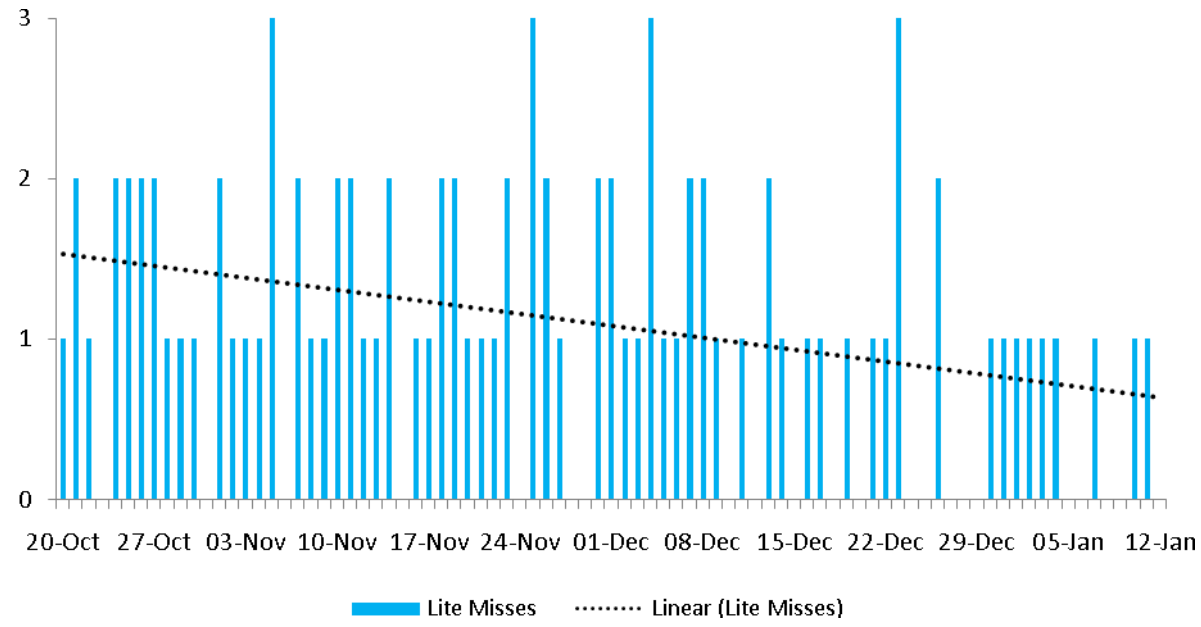

Figure 4: Lite misses over the project period

The number of misses on lite runs clearly decreased as the project progressed. However, by moving the Meadow Fresh SKU, it meant that more often than not the Anchor 1L lite SKU would be hit by any milk shortages or excesses. Any ATP miss on Anchor products was considered unacceptable by Fonterra, therefore it was determined that supervisors would need to put in extra effort to manage any milk shortages or excesses, and distribute them over all lite SKUs.

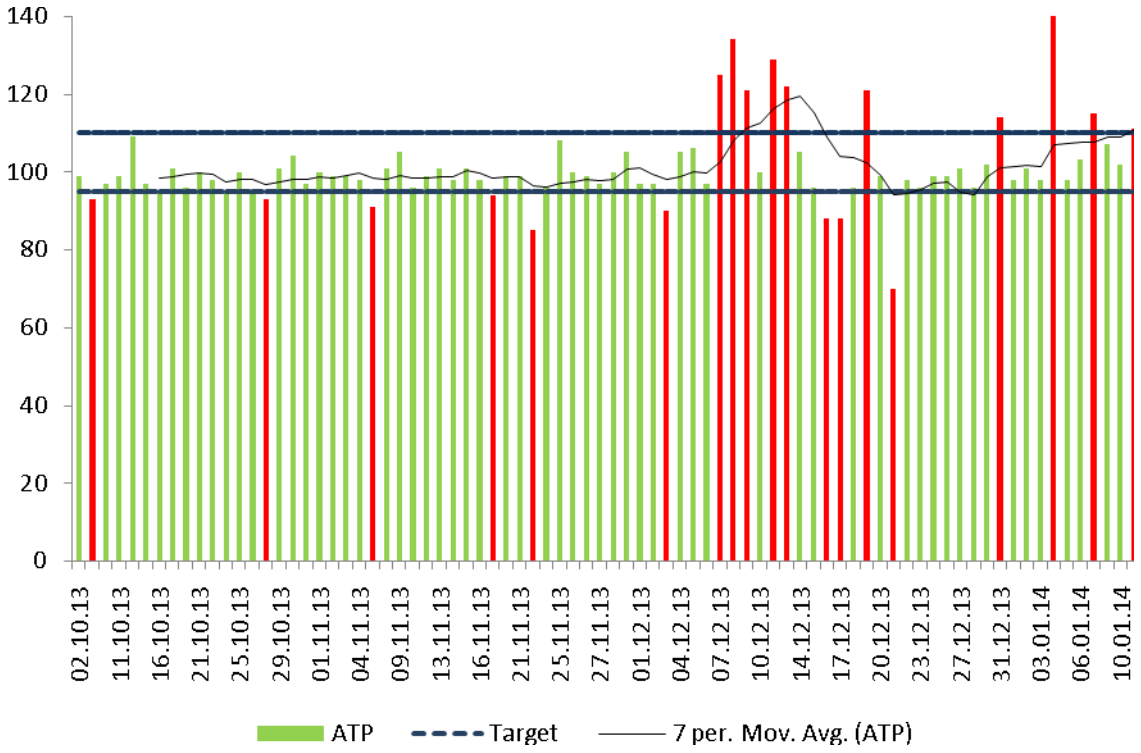

Figure 5: Anchor 1L Lite ATP with 7 day moving average

As the lite misses began to decrease (early December) it can be seen that the Anchor 1L lite ATP began missing the target. The 7 day moving average shows slight improvement in the ATP since initial implementation; however, misses were still occurring on occasion.

2.2 Production

2.2.1 Farmhouse Water Flush

Based on both data collected during the investigation, and also historic data, it was found that the second Farmhouse SKU packed consistently missed. Misses were always under, indicating that there was always a shortage of milk. Each day the Farmhouse was produced, the same volume of milk was made (4000L). The following points were determined as potential causes:

1. Too much milk was run off each time, meaning there was not enough milk to finish the second run.
2. Not enough milk was allowed during planning for runoffs and process losses.
3. Panel was consistently making a shortage of milk.

There was a belief amongst the supervisors that the issue was around point 1. It was indicated that changes between one milk type and another were difficult to determine accurately, therefore operators were running off extra milk to ensure the final product was in spec. This was picked up in the Farmhouse because of the small batch size.

An action plan was trialled where prior to Farmhouse runs, a water flush would occur down the pipelines. This would clear out any remaining milk product, and allow operators to more accurately perceive the changeover point, removing the need for excess runoff.

Results were found to be successful, with the average Farmhouse ATP increasing over the project period. It is estimated that based on the average wastage before the action plan implementation verses average wastage after, approximately 19000L milk is saved in rework each year. Figure 6 shows the improvement in Farmhouse ATP as the project progressed.

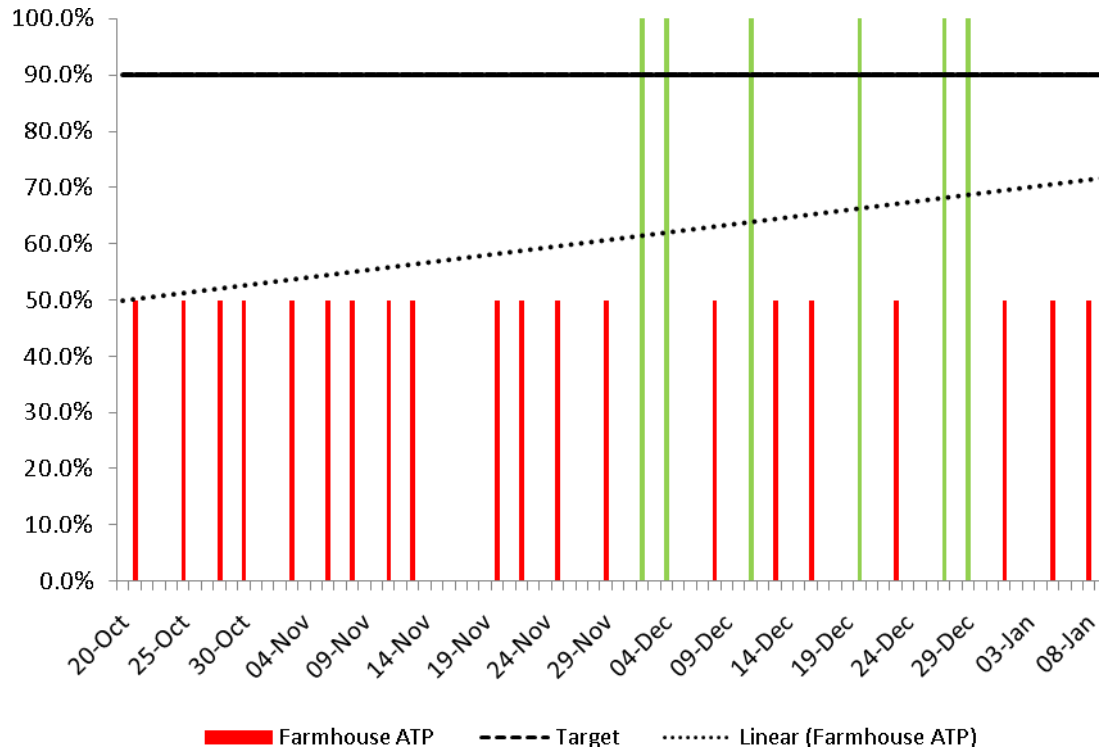

Figure 6: Farmhouse ATP over project period

This method could work to improve milk losses over all white milk types, however the cost benefit must be considered, as time as well as remaining previous product in the line is lost.

During the recent busy Christmas period, Farmhouse ATP decreased. It is likely that the water flush was being missed due to time constraints on the production team. It is recommended that the supervisors be reminded of the necessity of this flush in future.

2.2.2 1L Bottles left on the Table

A large contributor to the 'process issue' reason code was around orders being missed because the order was completed halfway through a bag of bottles. As it is considered preferable to fill all bottles rather than throw bottles out, the operators then had to decide whether to finish the order short, or fill another entire bag and over fill the order.

One action plan addressed this issue with the 1L bottles. As they are used every day, it was determined that on the final 1L run each day the order would be filled entirely, providing no other

issues prevented this from occurring. Any remaining bottles on the table would then be covered and left until the next morning preventing a miss on this run.

It was left up to the supervisors to implement and manage this strategy. It was reported prior to Christmas that one shift was already doing this, while the other shift planned to begin. During the busy Christmas period it is probable that this has been forgotten as other priorities surfaced.

The results of this action plan were inconclusive, as the level of implementation was not clear.

2.3 Panel

2.3.1 Lite Volumes

Upon analysis of ATP prior to the implementation of action plans, it was found that the lite ATP was particularly variable. There was a common belief that this was down to panel making an incorrect volume of milk. It was suspected that when two tanks were used to make the total lite balance it was difficult to get the product into spec, and so extra or not enough milk was made as a result.

An analysis was carried out on the volume of milk made by panel each day compared to the volume ordered, and also the tanks used to make up the volume.

Figure 7: Comparison of percentage packed vs. percentage of volume produced by panel

Figure 7 shows the percentage of planned milk packed against the percentage of planned milk made by panel. It can be seen that the variation in 'panel percentage' is far less than the variation in 'factory percentage'. Assuming that the information provided by panel was accurate, this should not be a contributing factor.

The average 'panel percentage' for days when one tank was used was calculated, and compared to the average 'panel percentage' when two tanks were used. The percentage for each scenario was 100.1%, suggesting that not only is the volume of milk made by panel consistently accurate, but that the number of tanks required does not present an issue.

2.4 Supervisory

2.4.1 Cream Changeovers

The cream ATP was also found to be particularly variable. The production supervisors suggested this was caused by the cut offs for cream at the end of the day often running across two lines. Supervisors managed the final volumes of product to ensure that any excess or shortage was distributed across multiple SKUs, and no singular product received a large hit. When two cream products were cutting off at the same time it was difficult for the operators to manage this.

It was determined that supervisors should provide extra supervisory support to operators during these cut offs where possible. Figure 8 shows a clear upward trend in the cream ATP prior to the Christmas period, suggesting that this extra supervision was proving successful.

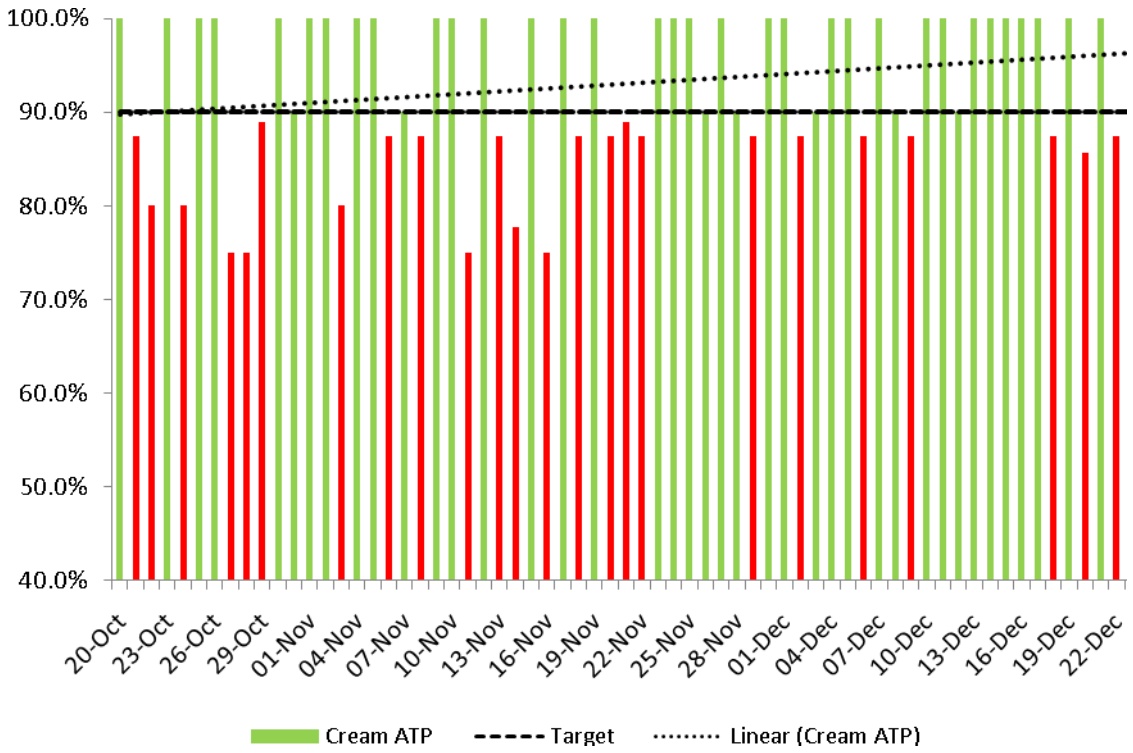

Figure 8: Cream ATP prior to the Christmas period

Christmas is the busiest period of the year, and particularly for cream. The cream ATP progression for the entire project period can be seen in Figure 9.

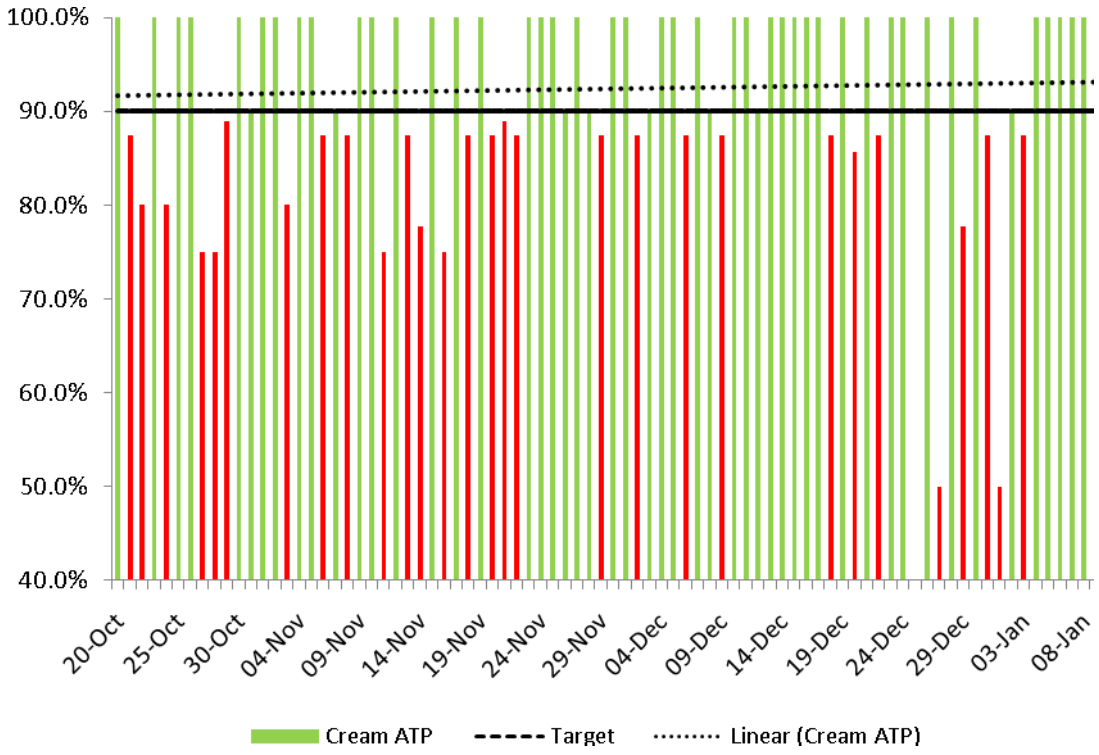

Figure 9: Cream ATP progression for the entire project period

A slight upward trend is still seen here, although the total trend is pulled down by the Christmas period. This is an exceptional time of year for cream production, and so the trend should be considered with the exclusion of Christmas.

2.4.2 Load Cells

Supervisors used load cells to determine the level of milk remaining in the supply tanks. If for whatever reason there is a shortage or excess of milk, they use load cell readings to distribute the hit over multiple SKUs rather than have one large hit. The load cells are known to be inaccurate, and it has been indicated that they should be used as an indicator and nothing more.

For a period of three days (16, 17 and 18 December) the supervisors were told to ignore the load cells, and pack only what the plan indicated. A longer trial was impractical as the action plan was developed close to the Christmas period. The overall ATP results for each of those days were 89%, 90.6% and 94.3%. These values were representative of low, standard and high values typical for surrounding dates. The reason code given for all misses over the trial period was 'WIP shortage'.

The trial was deemed inconclusive, and should be carried out over a longer timeframe during a period of regular production.

2.5 Behavioural

2.5.1 Target Awareness

An issue that emerged in the initial project presentations was a lack of awareness of what ATP was, and what the targets were. There was a common misconception that by implementing action plans the system was being 'cheated' rather than making tangible process improvements. Some operators and supervisors believe the target was +10%/-10% as this is how SAP calculates ATP. In a few cases people were unaware that the ATP target even existed.

By clarifying the target and explaining the reasons around the ATP measure, operators were able to consciously strive to hit on every SKU. The target was being visibly monitored at the same time. The apparent managerial oversight assisted in encouraging the production team to achieve hits.

While specific action plans were able to correct issues in a variety of areas, it is believed that this increased awareness played a significant role in improving the ATP results overall.

2.5.2 Shift Competition

Approximately half way through the project, results began to be monitored on a shift by shift basis. This was an attempt to decrease the discrepancy between results in the two shifts. The cumulative ATP, best ATP day, number of missed days and number of hit days were published on the ATP board. Teams were named 'team black' and 'team red' to avoid any perceived favouritism by using titles such as 1 and 2, or a and b.

This successfully fostered shift competition, particularly between the supervisors in the early stages as one shift was achieving distinctly superior results to the other. However, as the action plan succeeded and results became standardised, the monitoring of shift achievement became irrelevant.

3.0 Results

This section presents the overall ATP results as tracked over the project period. Figure 10 shows the daily ATP values from one month prior to project action plans being implemented through to the project close up. Red indicates a miss, green indicates a hit, and blue indicates a day where something exceptional outside of the production team's control occurred. The blacked dotted line indicates the 90% target.

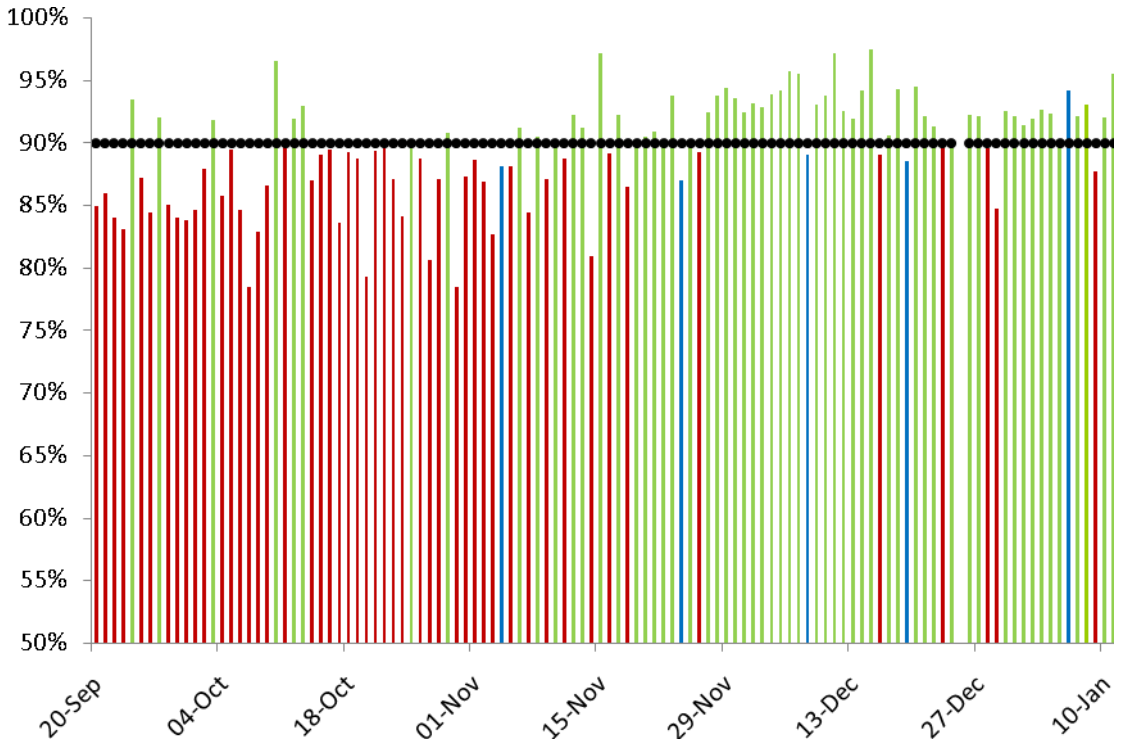

Figure 10: Daily ATP Tracking

Weekly ATP values are seen in Figure 11. Again, red indicates a miss while green indicates a hit. Week 47 was the first week that managed a hit overall, with this trend then continuing. A slight dip over Weeks 52 and 1 illustrate the Christmas and New Year period, with week 2 recovering from this.

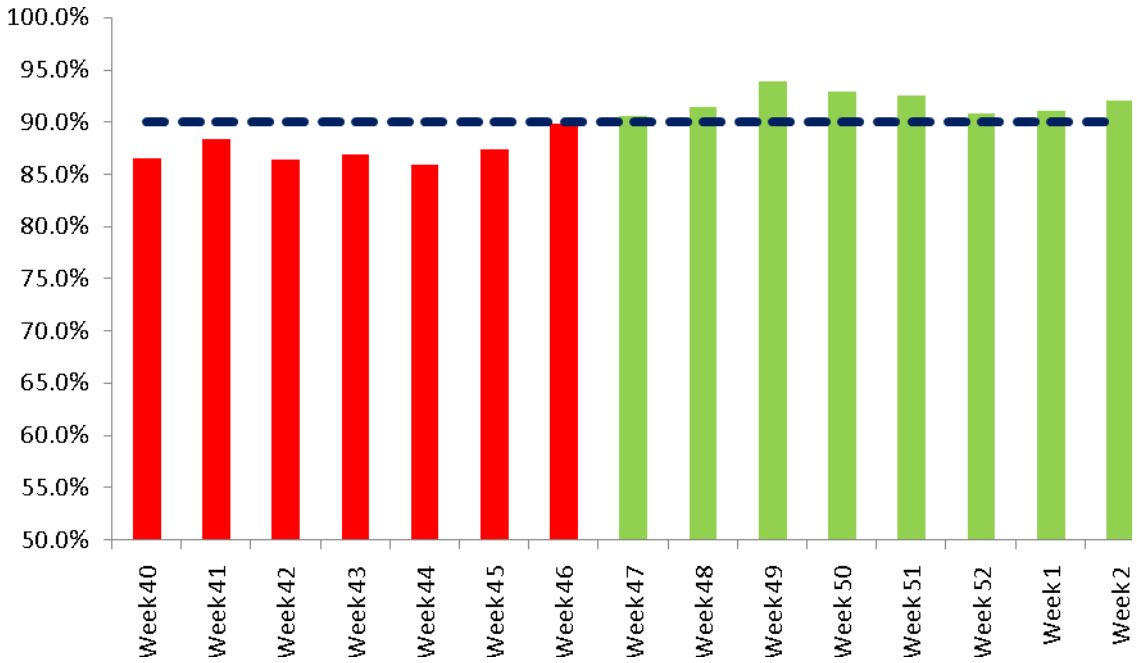

Figure 11: Weekly ATP Tracking

Figure 12 illustrates the ATP progression for financial year 2014 by month. From the project conception in October there was a steady increase in monthly ATP. December presents the first month with an overall ATP hit. This is a particularly notable achievement considering the busy nature of this period.

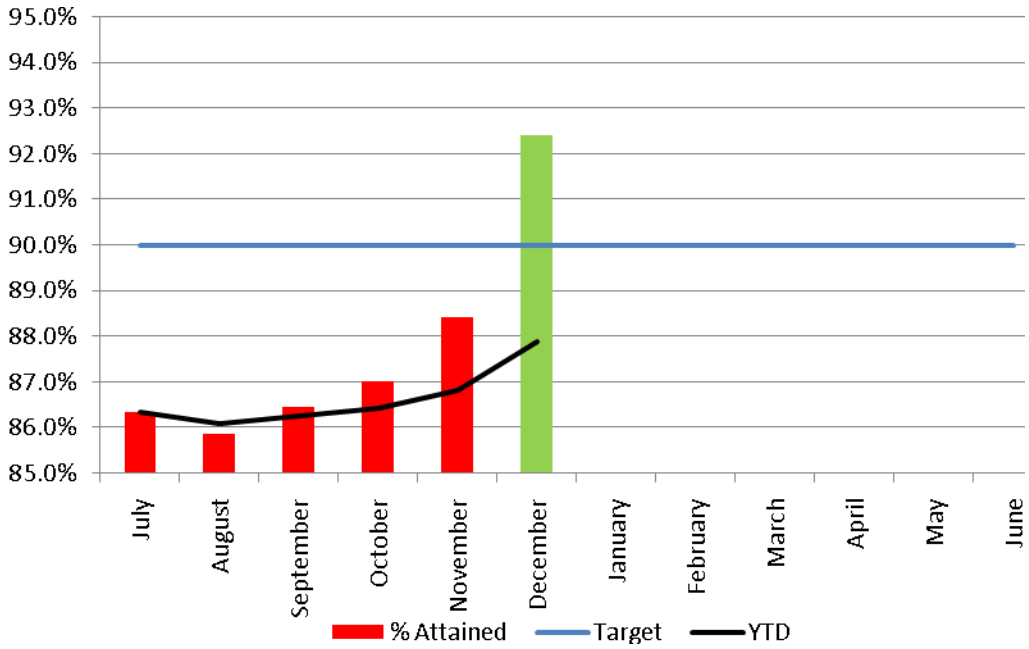

Figure 12: Monthly ATP, F14

4.0 Recommendations

Figure 13 shows the distribution of all reason codes collected over the project period, finishing during Week 3 of 2014. The most significant sections were WIP shortage, WIP used up excess and crew issue.

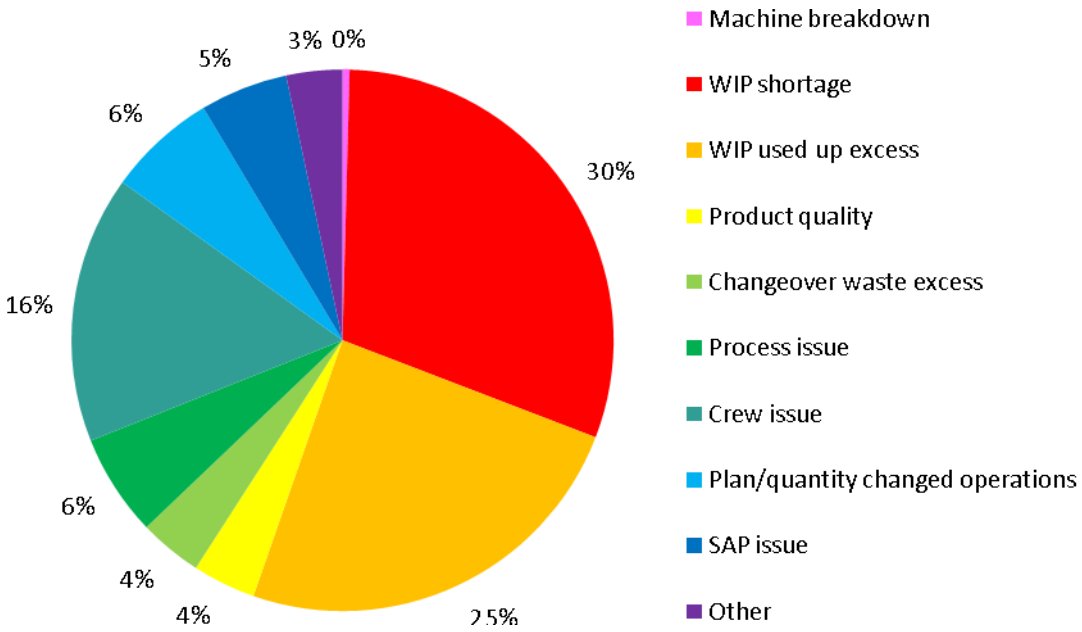

Figure 13: Reason Codes, 27/10 – 14/1

The following recommendations are made to decrease misses to 25 per week. They are based on improving the three significant sources of misses as above.

1. An alarm or stoppage system should be set up on the labellers. The operator could key in the number of bottles ordered at the beginning of a run, and the labeller would react when that value was reached. The production manager and supervisors should determine whether this reaction should be a stoppage of the line, or an alarm that went off at or close to the order number of bottles, or some other reaction. This would decrease the number of ATP misses due to operator error. Feedback suggests that the labellers are already capable of this function, and would only require programming time before implementation.

2. There are four recovery tubs feeding into a large recovery tank via one pipe. The singular small pipe causes flow restrictions, meaning that the recovery tubs are often full when run offs occur. This causes two issues:

    a. Run offs are less accurate as operators are pumping milk out of the tubs at the same time as they are filling them, causing excessively large amounts of milk to be run off at times.

b. Time is lost as operators wait for tanks to empty for run offs, or milk is overflowed onto the floor and lost rather than recovered. This not only demonstrates wastage, but also causes time pressure to build up.

It is recommended that each tank be piped separately to the recovery tank in order to overcome this flow restriction. Feedback indicates that the current pumps are powerful and would not cause any restriction to flow.

3. A small screen should be installed in the production area for each filler. They may be located on each filler or be free standing. They would display information currently collected by the supervisors and operators from the redline office, such as the tank currently supplying the filler, the level of the tank, and the product in the supply tank. This would have three benefits:

    a. The information would be readily available to operators, decreasing the chance of the bowl unexpectedly becoming empty if the tank was supplying multiple fillers.

    b. Operators would be able to see immediately if the incorrect tank had been connected to the filler, minimising milk and material wastage should product be put into the incorrect bottle.

    c. The chance of operators missing a cut off while walking to and from the office to obtain tank information would be decreased.

    The placement of the screens, and the information displayed on them should be determined by the production manager and supervisors.

Additionally, it is recommended that the action plans as discussed in this report be continued. The production team should follow the ATP calculation procedure as designed by the project manager, and should have regular meetings to address ATP issues. This will assist in continuing to drive improvement, so that progress made during this project is not lost upon completion.

Continued managerial interest is critical and should be visible around this area, and a focus should be set on maintaining production buy in. The site manager should provide a recognition/reward for the production team if they achieve the ATP target for the quarter. This should be in a form considered most appropriate by the site manager.

5.0 Reflective Summary

This reflective summary examines the success of the project, and the challenges involved in successfully meeting the deliverables.

5.1 Work with the production team to decrease misses to 45 per week

Challenges.

Team buy in. From the beginning of the project a major hurdle was to secure team buy in. There was a strong feeling from within the production team and from the production manager that the 90% target was unachievable without significant financial investment, and that no investment would occur. Buy in had to be carefully managed as discussed in the project methodology report, but in particular the project purpose had to be illustrated. Time was spent explaining to the production team how in order to gain investment, data had to be collected, and reasons for misses had to be shown in order to build a case for new equipment.

This created a particular issue when implementing action plans. The production supervisors take particular pride in the standards they achieve, and were therefore hesitant to trial suggestions that they felt would fail. In order to prove that there was a production problem, manipulation of systems had to be halted to illustrate the issue; however production did not want to miss on orders. Time was spent explaining how one bad production week would prove that current systems were insufficient.

Result.

As initial understanding of ATP increased early in the project, hits on individual days began to occur. After the implementation of early action plans the first overall week was hit. The success of the project was communicated to the production team, through both notes in the daily communication sheet and also the presence of the project manager at foyer meetings. This fostered enthusiasm and increased buy in from the team, and it became expected that any one day would achieve the target. By the close up of the project the production team had successfully achieved a hit over a month.

Lessons Learnt.

In order for a project to succeed, everyone involved must buy into the project. This must be managed from the beginning of the project, but also may take time. I found it rewarding at close up meetings to hear how a highlight for the supervisors was the buy in they got from their operators, and how efforts made by myself and the project sponsor were deemed successful. I was surprised by the level of disillusionment that many of the supervisors felt in regard to the chances of getting any support from head office, and the culture detachment. I experienced firsthand how initiatives put in place at the top do not always have the intended trickledown effect. However, I also saw how some members of the Meadow Fresh management team realised how culture change was more important than process change. Finally, it was surprising and rewarding to see how a small amount of effort along with some focus could lead to the target being continually achieved without any financial investment.

5.2 Make recommendations to decrease misses to 25 per week

Challenges.

Preconceptions. It was believed upon conception of the project that there was a major issue with tank capacity in the plant; therefore a major recommendation would be to purchase new tanks, requiring major investment. This made it difficult to examine alternate issues, therefore the tank issue was investigated early on. It was shown that there was no issue with tank capacity, however the production team believed that panel was 'fudging the numbers', or otherwise had faulty equipment for measuring tank volume. There was a disconnect between production and panel communication and systems, causing each team to believe the other team was at fault when there was an issue.

The production team and other operations staff had to be shown clearly and convincingly that there was not an issue with tank capacity before other suggestions could arise. It was determined that the best way to decide what equipment was required was to get different areas of the production team to make a 'wish list', and then compare those lists with the apparent sources of misses.

Result.

Recommendations were made around decreasing operator error and standardising planned milk losses as these were the areas that were causing the most consistent issues, while being able to be remedied in the foreseeable future. The 'wish lists' of each group contained some overlap, and the entire production team as well as the site manager were happy with the final recommendation set. It is now up to the management team to determine the viability of the recommendations with the potential cost savings vs. cost outlay, and make a decision around implementation.

Lessons Learnt.

Communication was an area that was weak between some areas of the business. It was interesting to note how somebody's feeling that there were not enough tanks had managed to filter all around the site, and was able to initiate a project dedicated to fixing this issue. This myth however was relatively simple to prove wrong, and the tricky part then came in convincing staff on site that the information I retrieved was reliable.

5.3 Hand over a documented process for measuring and improving ATP

Challenges.

Data manipulation. The method for extracting ATP data out of SAP at the project introduction involved a significant level of manipulation in Excel. This both made the process time consuming, and allowed ample opportunities for error. As many members of the production team were very busy and did not have an extensive knowledge of Excel, a simple method of manipulating data had to be created. The project manager spent a significant period of time building automated master spreadsheets that could be easily set up. SAP reports could then be copied and pasted into the sheet, meaning that the time required to determine the ATP of all product types for the previous day was approximately two minutes.

It was important that in order for the ATP results to continue to improve after the project close up the system for determining results was easy and fast, otherwise the production supervisors would quickly give up on the concept. Detailed procedure sheets with both word descriptions and pictures were created explaining to a basic level the step by step process for using the sheets.

Continued focus. There was a high probability that without deliberate focus, ATP results would revert back to F13 values once there was no longer a person driving the project full time. The procedure for calculating ATP was only one part of ensuring that the focus remained. In a close up presentation it was explained to the production team that during one of their weekly meetings ATP results should be discussed, and action plans reviewed. The support of the site manager and production manager was given to this concept. In addition the site manager agreed to take the production team out for a reward if they achieved an overall hit for the current quarter. This incentive was designed to demonstrate the emphasis that management was continuing to put on achieving the measure.

Result.

The production team were open to continuing the review of ATP. Two 'champions' have been trained in the ATP calculation process, and have been instructed to teach this process to other production supervisors. Whether the project yields consistent process improvement will only be seen with time, however it is believed by the project manager that the right processes and incentives have been put in place, and the culture has been developed to continue to see improvement. It is up to the production manager and site manager to see that this culture is continued, and that buy in is retained.

Lessons Learnt.

It will be interesting to monitor the ATP results throughout this year, and also to find out if recommendations made are implemented. The teams involved are now in a prime position to either pull in the ATP measure closer to 100% and continue to improve site production, or to drop the project and revert back to constant misses. Many of the action plans implemented require action and focus from operators and supervisors to succeed, therefore continued buy in is critical.

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7.0 Appendices

Appendix 7.1 Project Methodology Report

The project methodology was designed to be used as a template for future projects on site. The steps suggested in order to carry out a project successfully are described in the project methodology report.

7.1.1 Project Methodology

1. **Project Induction.** The project manager spent time orientating themselves in the production environment. This involved plant tours, and spending time learning the roles of key employees to the project.

2. **Project Proposal.** A project proposal was outlined detailing the project scope, objectives, and deliverables. This was then signed off by the project manager and project supervisor.

3. **Project Presentation.** The project was presented to the site manager, briefly detailing the major sections of the project proposal.

4. **Team Presentation.** The project was then presented to all involved parties. The purpose of the presentation was to clearly define:

a. What was expected from each individual or group

b. How the project would impact each individual or group

c. Why the project was important to each individual or group, as well as the site and company as a whole

5. **Observation.** The project manager spent time observing 'business as usual' activities so that an understanding of the current state of the project area could be built up. This included understanding the culture around the focus area, and any common beliefs around production constraints.

6. **Current State Analysis.** Before improvement could be considered, the project manager spent time analysing historical data. This created a full and clear picture of the current state of the plant ATP activity prior to the project.

7. **Reason Code Collection.** Each morning the project manager would print off a SAP report detailing the previous day's ATP results. All ATP misses would then be documented on a 'Reason Code' sheet. High level reasons for the misses would be obtained from the production supervisors. These reasons were tracked to determine the frequency of the issues.

8. **Investigation.** The project manager would then attempt to understand the root cause behind the high level reasons. This would involve meetings with key personnel, observation and data analysis.

9. **Team Meetings.** The production team supervisors, project manager, planner, team leaders, project sponsor, and any other relevant parties (variable during project progression) met once a week for an ATP review meeting. As the production team works in shifts, this meant that each shift would attend a meeting once per fortnight. At this meeting the current project state was reported on. This was the forum for the conception of action plans, therefore it was critical that all parties involved in implementation were present. Meetings provided an opportunity to discuss and implement ideas or theories that team members had, but previously have had no opportunity to test.

10. **Action Plan Tracking.** The results of the action plans were then tracked and reported back on at the next review meeting. This allowed them to be altered or removed quickly if unsuccessful, and made permanent if the results were favourable.

11. **Transparency.** Minutes of each meeting were recorded and sent out to both parties in attendance, and secondary parties who did not attend. Minutes were also printed and presented on an ATP board in the milk station foyer. This made project information easily accessible to anyone on site who might be interested, but particularly production operators. This board also included data and results from action plans, along with daily, weekly and monthly ATP data.

12. **Project Tracking.** At the end of every week, the project manager submitted a progress report to Les Richards and Bryan Rooney. These detailed how closely the project was tracking to the timeline, the project risks, the work done in the previous period, and the work to be done in the upcoming period.

7.1.2 Team Buy In

The project was reliant on buy in from the production team, as it was up to them to implement action plans and provide reasons for misses. A number of factors were used to attempt to manage team buy in:

1. **Initial presentations.** From the project conception it was determined that visibility would be critical to obtaining team buy in. As soon as the project was defined project introduction presentation occurred. These were carried out in the main boardroom rather than the regular milk station meeting rooms, and morning tea was provided. This was to attempt to differentiate the project from regular activity. During these presentations, the level of participation required of each party was described, and also the potential benefits to each individual.

2. **Management buy in.** There was a risk that the project would be seen as a fruitless endeavour, as the production team culture held the view that no investment would occur. The buy in of management to the project was demonstrated through physical presence, and also by showing how information collected would be relayed upwards.

3. **Action plans.** Project participation was deemed critical in obtaining team buy in. For both this reason, and their superior knowledge of the process, it was decided that action plans would be determined by the production supervisors. In this way they could own the process, and would have an opportunity to test hunches. Improvements to the plant ATP would be directly related

to their decisions. It is believed that this was a more effective process than to have changes dictated by the project manager.

4. **Transparency.** All information relating to the project was to be available to any person wanting to see it. By allowing all staff to track the project progress, they were able to remain as involved in the project as they chose. It also minimised the chances of misconceptions developing about the project action plans or motives, and assisted in keeping the project visible.

5. **Celebrate successes.** When successful results were obtained, it was important that they were acknowledged. This was done through announcements in the daily communication sheet, reports by the project manager at foyer meetings, and affirmation down the chain from the production manager to the production supervisors, and then to the operators. When the first entire week successfully met the target cake was provided for afternoon tea to all operators as an acknowledgement of their efforts.

6. **Handover.** A deliverable for the project was to be able to hand the ATP data collection process over to the production team. This involved writing a process document for the data analysis, and training two 'champions' in the use of the process who would in turn train other staff members. It was important that at this final stage the production team owned the process.

7.1.3 Project Close Up

The closing stages of the project were important in creating a seamless handover. As ATP analysis is to continue on from the end of the project, the close up was designed to create a clear picture of the current state, and a description of the project successes and failures.

1. **Closing Presentation.** Presentations were made to the production team, and other interested parties on site. This presentation was designed to provide an overview of the project, including the project purpose, methodology and results.

2. **Closing Report.** A closing report was written detailing the successes and failures of the project, along with final project recommendations. This was then submitted to the site manager.

Appendix 7.2 Risk analysis

Risk Category			
1-4	Low	9-12	High
5-8	Moderate	13-16	Extreme

Risk Area	Consequence (1-4)	Likelihood (1-4)	Risk Category (1-16)	Comments
Road Blocks	4	2	8	In order to decrease the likelihood of roadblocks affecting the project, clear governance was defined early on, and support from the site manager was made visible.
Time Delays	3	3	9	As the project was focused around investigation, it was difficult to set an accurate timeline, therefore time delays presented a considerable risk.
Scope Clarity	2	1	2	The project scope was defined and signed off on by the project manager, sponsor and supervisor.
Scope Variation	2	3	6	Scope variation presented a viable risk as with time delay, as the project path was difficult to predict.
Unavailability of Production Team	4	2	8	The production team buy in and availability was critical to the success of the project, therefore this posed a significant risk.
Knowledge	4	2	8	Areas of the project sit outside the project

				manager's areas of expertise. Therefore availability of knowledge could present a risk to the project.
Unavailability of Mentors	2	3	6	This issue sits in line with the knowledge risk. Mentors are required to fill gaps for the project manager, however they are not the only source of information.

Appendix 7.3 Literature Review

Source	Major points
Hawthorne Effect (Franke & Kaul, 2010)	• Social factors strongly affect job performance. Environment and culture have a stronger effect than personal aptitude • Relationships with supervisors have a strong influence on the response of workers • Workers will quickly decide what they feel is a fair days work. If they feel they are being treated fairly they will work harder.
Dairy Manufacturing (UNEP, N/A)	Significant sources of waste are: • CIP processes, cleaning, washing. and sanitising • Start ups, changeovers, shutdowns • Stoppages due to equipment jams and breakages • Reprocessing of out of spec product • Maintenance

Batch Scheduling in a Lean Manufacturing World (Liddell, N/A)	• Batch manufacturing clashes with lean manufacturing ideals which dictate a make-to-order system
	• Manufacture resource planning (MRP) makes it difficult to tie batch orders to actual customer demand
	• A batch scheduling system must be able to:
	  ○ Schedule batches
	  ○ Assign separate orders to batches
	  ○ Edit batch contents
	  ○ Schedule additional operations

Reducing Human Error on the Manufacturing Floor (Callazo, 2010)	• The following factors contribute to human error:
	  ○ Procedures
	  ○ Human factors
	  ○ Training
	  ○ Supervision
	  ○ Communication
	  ○ The individual themselves
	• Organisations are responsible for eliminating the possibilities of external factors influencing human behaviour.
	• The following factors should be considered by organisations to decrease human error:
	  ○ Providing clear, accurate procedures, instructions and other job aids
	  ○ Implementing good human factors engineering for control systems, processes, equipment, and work environments.
	  ○ Provide relevant training and practice
	  ○ Provide appropriate supervision
	  ○ Assure good communications

	○ Make sure the personnel have all the capabilities needed to succeed in the task • In order to implement these organisations need: ○ A structured human error investigation process ○ Consistent terminology (root causes) ○ Tracking/trending system ○ Effectiveness based on root cause recurrence
Preparing your Production Plan (SME, 2013)	• A production plan should allow a company to meet the following objectives: ○ Minimise cost ○ Maximise customer service ○ Minimise inventory investment ○ Minimise changes in production rates ○ Minimise changes in work-force levels ○ Maximise the utilisation of plant and equipment • There are three different strategies for addressing demand fluctuation: ○ Chase demand strategy. This matches the production rate to the demand through hiring and firing of employees. ○ Level production strategy. Manages demand variation with changing inventory levels, allowing order backlogs, and altering marketing strategies. ○ Mixed strategy. Demand variation is managed through stable workforce but variable working hours, subcontracting/out sourcing, changing inventory levels. • Each method has its advantages and disadvantages, and a method should be chosen based on the nature of the product. Meadow Fresh follows the mixed strategy, with the workforce being a fixed cost centre.
Selecting Attributes to Measure Objectives (Keeney & Gregory, 2004)	• When selecting attributes to measure objectives (KPI's), they should be the following: ○ Unambiguous. There should be a clear relationship between the attribute and consequence. ○ Comprehensive. The attribute should cover a range of possible consequences and value judgements. ○ Direct. The attribute levels directly describe the consequence. ○ Operational. Information to describe consequences can be obtained, and value tradeoffs can be made. ○ Understandable. Consequences and value tradeoffs made using the attribute can be readily understood

	and communicated. • All points above are interrelated, so the attribute must cover them all to be robust
How to Manage a Project (Reh, 2013)	• The following steps were listed as particularly important in managing a project: ○ Define the scope. ○ Determine available resources. Identify the people that will be required to make the project succeed. ○ Create a baseline plan. Create big and then small steps that will make up your project, and timeline them. ○ Monitor progress consistently throughout the project. This will make it easy to catch up if things fall behind. ○ Document everything. Document all changes to the plan. ○ Keep everyone informed. Let all stakeholders know of successes, and also any problems that arise. Also keep the team informed of results and plan changes.

Appendix 7.4 Tables and Figures

Table 1: SKU types affected by planning changes

Milk Type	Volume
Meadow Fresh Calcitrim Carton	1L
Meadow Fresh Farmhouse Carton	1L
Meadow Fresh Lite Carton	1L
Meadow Fresh Standard Carton	1L, 300mL, 600mL
Meadow Fresh Trim Carton	1L, 300mL, 600mL
Meadow Fresh Calcitrim Bottle	3L
Life Trim Bottle	3L
For Everyone Banana Bottle	300mL
For Everyone Chocolate Bottle	300mL
For Everyone Strawberry Bottle	300mL
Tararua Iced Coffee Bottle	350mL
Meadow Fresh Cream Bottle	300mL
Cool Change Orange Juice	300mL
Cool Change Orange and Mango Juice	300mL

Table 2: Reason code classifications

Reason Code	Description
Machine Breakdown	Any machine issue that affected ATP, e.g. if a line was damaging bottles so that they were thrown out.
WIP shortage	A shortage of material, meaning the order was not able to be filled. This may be a shortage of milk, bottles, or caps.
WIP used up excess	Continuing to pack despite the order being filled to use up a material. E.g. extra milk left in the tank, or extra bottles sitting on the table.
Product quality	This could be an issue with milk quality e.g. milk out of spec, or other material quality e.g. underweight bottles.
Changeover waste excess	This mostly occurs at the beginning of a run, when the process order is based on the number of bottles or cartons that come in a bag. As an entire bag or box is always packed, using extra material for setup can cause a miss.
Process Issue	This code was used when the process order would be filled halfway through a bag of bottles. The ATP would be under without putting on a new bag, but over if an entire other bag was packed.
Crew Issue	When an operator made a mistake causing the ATP to be missed, this was classified as a crew issue.
Plan/quantity changed operations	When a planned change was made during the day this would show up as a miss in the SAP report, as a different number of units would be packed than was originally specified.
SAP order differed to DWOR order	This code was used when there was a data transfer issue between DWOR and SAP, causing the operators to believe the order was a different value to the system.
Other	This code classified misses that did not fit into any of these categories, or misses that reasons could not be given for.

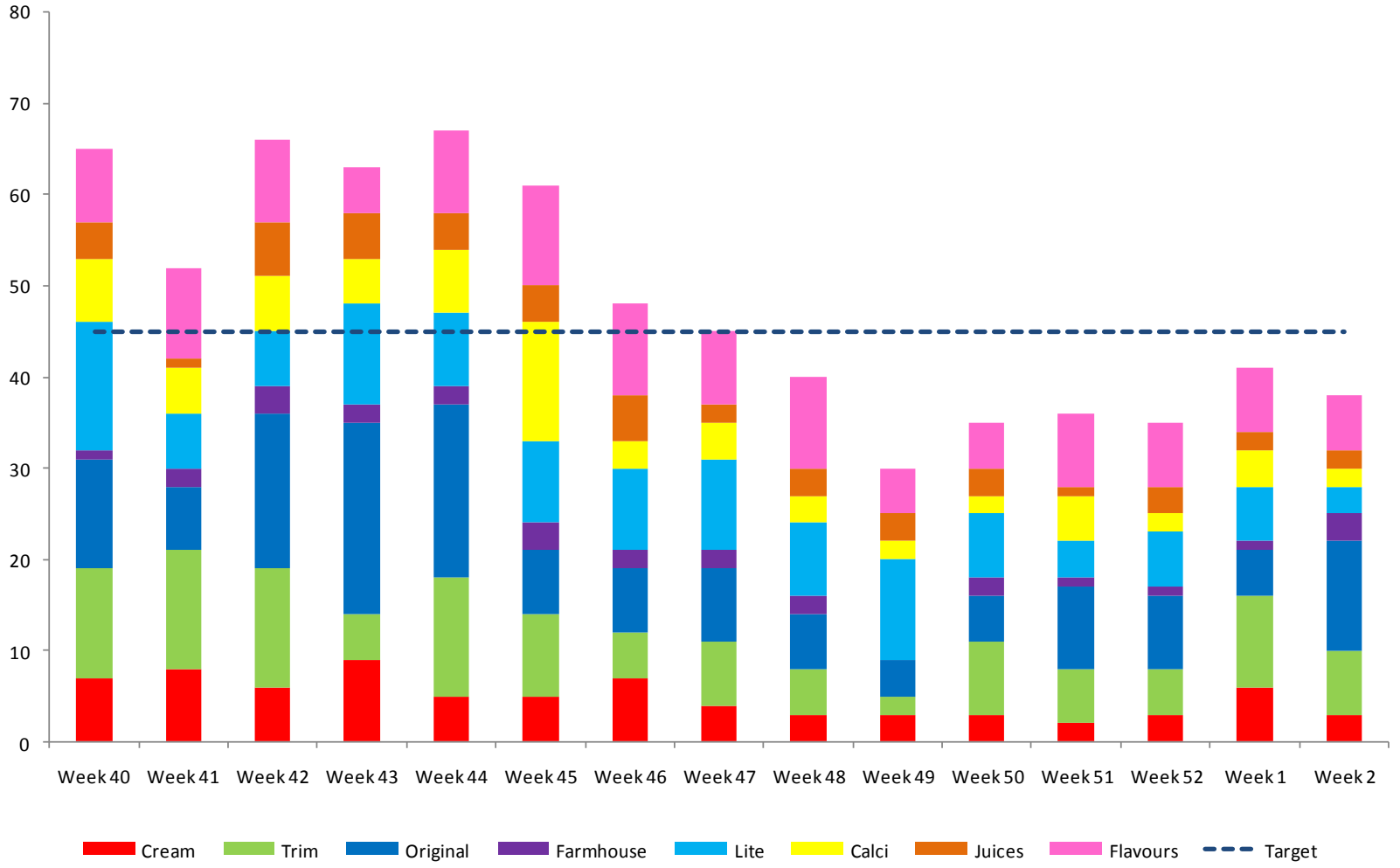

Figure 14: Misses by milk type